

# INDUSTRIAL INTERNET OF THINGS (AEIE 5243)

**Time Allotted : 2½ hrs**

## Full Marks : 60

***Figures out of the right margin indicate full marks.***

***Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.***

***Candidates are required to give answer in their own words as far as practicable.***

## Group - A

1. Answer any twelve:

$$12 \times 1 = 12$$

*Choose the correct alternative for the following*

(viii) Which layer in IIoT is responsible for managing and securing industrial assets?\*\*  
 (a) Application Layer (b) Asset Layer  
 (c) Security Layer (d) Physical Layer.

(ix) What is a major role of business analytics in IIoT?  
 (a) Controlling industrial machines directly  
 (b) Optimizing business operations using data-driven insights  
 (c) Managing power consumption of devices  
 (d) Providing low-level network security.

(x) What is the biggest advantage of using LoRa over Wi-Fi in IIoT applications?  
 (a) Higher bandwidth  
 (b) Lower latency  
 (c) Lower power consumption and longer range  
 (d) Better support for video streaming.

*Fill in the blanks with the correct word*

(xi) Unlike HTTP, MQTT and CoAP are preferred in IIoT due to lower \_\_\_\_\_.  
 (xii) The IEEE standard for ZigBee is \_\_\_\_\_.  
 (xiii) LoRaWAN operates in the \_\_\_\_\_ spectrum.  
 (xiv) XaaS in cloud computing stands for \_\_\_\_\_ as a Service.  
 (xv) A fog computer processes data closer to the \_\_\_\_\_ before cloud transmission.

## Group - B

2. (a) Explain the key differences between IIoT and traditional IoT. *[(CO1)(Understand/LOCQ)]*  
 (b) Describe the architecture of IIoT with a diagram. Explain the role of sensors, edge devices, gateways, and cloud computing. *[(CO2)(Remember/LOCQ)]*  
 (c) Compare IT and OT infrastructure in an IIoT framework. How does their integration impact industrial automation? *[(CO1)(Analyse/LOCQ)]*

$$4 + (2 + 2) + (2 + 2) = 12$$

3. (a) How does predictive maintenance work in IIoT? Explain with an example. *[(CO3)(Remember/LOCQ)]*  
 (b) Explain the role of fog computing in IIoT and compare it with edge computing. *[(CO1)(Create/HOCQ)]*  
 (c) How does IIoT help in supply chain optimization? Discuss with an example. *[(CO2)(Remember/LOCQ)]*  
 (d) Describe the business benefits of IIoT adoption in manufacturing industries. *[(CO2)(Remember/LOCQ)]*

$$(2 + 2) + 2 + (2 + 2) + 2 = 12$$

## Group - C

4. (a) Describe the various wireless communication protocols used in IIoT. *[(CO3)(Create/HOCQ)]*

(b) Compare ZigBee and Bluetooth for industrial communication. Which one is more suitable for IIoT? [(CO4)(Evaluate/HOCQ)]  
 (c) Describe the publish-subscribe architecture used in MQTT and its advantages. [(CO2)(Create/HOCQ)]  
 (d) What are the advantages of LPWAN technologies in IIoT? [(CO2)(Remember/LOCQ)]

**3 + 3 + 3 + 3 = 12**

5. (a) Discuss the role of software-defined networking (SDN) in IIoT. How does it optimize industrial network management? [(CO3)(Analyse/HOCQ)]  
 (b) Explain the importance of real-time scheduling in IIoT wireless networks. [(CO4)(Remember/LOCQ)]  
 (c) Evaluate the future of wireless communication in IIoT. What are the emerging trends and potential advancements in industrial networking? [(CO2)(Remember/LOCQ)]  
 (d) Evaluate the significance of 5G technology in IIoT applications. [(CO2)(Apply/IOCQ)]

**(2 + 2) + 2 + (2 + 2) + 2 = 12**

## Group - D

6. (a) Analyze the major cybersecurity threats in IIoT networks. [(CO3)(Apply/IOCQ)]  
 (b) Explain the various encryption techniques used in IIoT for securing data transmission. How do they contribute to system integrity and confidentiality? [(CO4)(Apply/IOCQ)]  
 (c) Evaluate the role of TLS/SSL in MQTT-based IIoT communications. How does it enhance data security and prevent unauthorized access? [(CO5)(Apply/IOCQ)]  
 (d) Discuss the significance of block-chain technology in securing IIoT applications. [(CO2)(Remember/LOCQ)]

**2 + (2 + 2) + (2 + 2) + 2 = 12**

7. (a) Compare the security benefits of fog computing and cloud computing in IIoT. Which approach is more effective in reducing cyber risks? [(CO5)(Remember/LOCQ)]  
 (b) Analyze the major data privacy challenges in IIoT cloud platforms. [(CO4)(Remember/LOCQ)]  
 (c) What legal and technical measures can be implemented to protect sensitive industrial data? [(CO3)(Create/HOCQ)]  
 (d) Discuss the importance of predictive security monitoring in IIoT. [(CO3)(Remember/LOCQ)]

**4 + 2 + 4 + 2 = 12**

## Group - E

8. (a) Discuss the role of IIoT in aviation and aerospace. [(CO3)(Analyse/HOCQ)]  
 (b) Explain the role of the value chain in IIoT. How does it facilitate the transformation from raw sensor data to actionable insights? [(CO4)(Remember/LOCQ)]  
 (c) Compare the traditional M2M value chain with the modern IIoT value chain. How has the shift to an information-driven value chain impacted industrial processes? [(CO6)(Remember/LOCQ)]  
 (d) Discuss the concept of open data in IIoT value chains. [(CO6)(Understand/LOCQ)]

**2 + 4 + 4 + 2 = 12**

9. (a) Explain how IIoT enhances predictive maintenance in industries. What are the key data analytics techniques used in predictive failure analysis? *[(C03)(Understand/LOCQ)]*

(b) Discuss the applications of IIoT in the energy sector. How does IIoT improve power generation, distribution, and smart grid management? *[(C04)(Analyse/LOCQ)]*

(c) Compare the role of IIoT in discrete and process manufacturing industries. How do IIoT applications differ in these environments? *[(C05)(Evaluate/HOCQ)]*

(d) How does sensor-based monitoring help prevent industrial accidents and hazardous exposures? *[(C05)(Remember/LOCQ)]*

$$4 + 3 + 3 + 2 = 12$$

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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	55.20	19.80	25